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AIP report MANPOWER STATISTICS DIVISION

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# 1979—80 SURVEY OF PHYSICS AND ASTRONOMY BACHELOR'S DEGREE RECIPIENTS

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During the 1979-80 academic year 4440 physics and 165 astronomy bachelor's degrees were granted. The present survey derives its data from the individual recipients of these degrees and focuses on their postbaccalaureate plans. Highlights of this report are:

- major changes in postbaccalaureate choices have occurred since 1975; a 10 percentage-point increase in civilian employment and a 9 percentage-point decrease in graduate study
- over 80% of the employment-oriented physics bachelors applied to only one type of employer in 1980
- a 17% increase in starting salaries in one year for the 1980 physics bachelors was recorded.

**Figure I** presents the changes in four postbaccalaureate plans of ten successive graduating classes. Ten years ago when the size of the graduating class was 30% larger, the distribution of postbaccalaureate plans was surprisingly similar to that of 1980 if one includes the military with the employment group. However, during that interim period of the 1970's fluctuations are evident for which the changing job market was responsible. For example the class of 1975 had the largest proportion of bachelors headed for graduate school (63%) and the smallest proportion interested in civilian employment (28%).

The first set of bars in **Figure I** distinguishes between "Physics graduate study" and "other graduate study", but the latter is usually a discipline closely related to physics. The second set of bars separates bachelors with military commitments from those who enter civilian employment.

**Figure I. Trend in postbaccalaureate plans of physics bachelors, 1970-80**

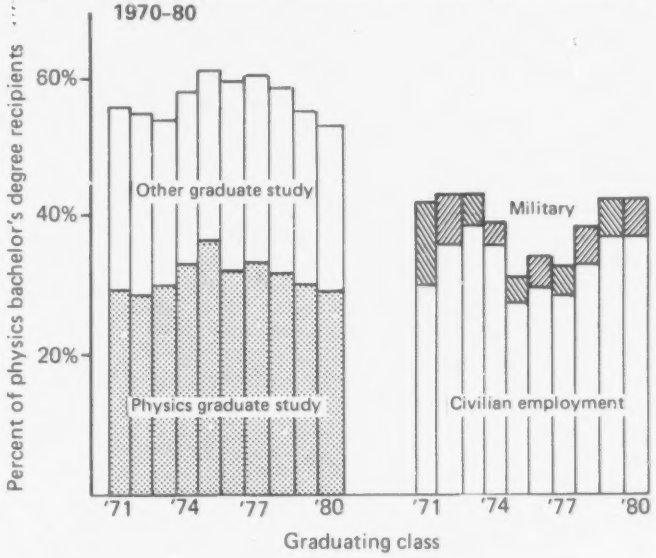


**Table I** presents the numerical data on which **Figure I** is based and also includes a small group of graduates who are undecided about their postbaccalaureate plans. The last row of **Table I** gives the total number of physics bachelor's degrees granted in the United States.

**Table I. Postbaccalaureate plans of successive graduating classes of physics bachelors, 1970-1980**

| Postbaccalaureate plans | Graduating Class 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 |
|---|---|---|---|---|---|---|---|---|---|---|
| Physics graduate study | 31% | 30% | 31% | 34% | 36% | 32% | 34% | 33% | 31% | 30% |
| Other graduate study | 26 | 26 | 24 | 25 | 27 | 28 | 28 | 26 | 24 | 24 |
| Civilian employment | 29 | 37 | 39 | 36 | 28 | 31 | 30 | 34 | 38 | 38 |
| Military service | 12 | 7 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 |
| Undecided | 2 | | 1 | 1 | 5 | 5 | 4 | 2 | 2 | 3 |
| Total number of physics bachelor's degrees | 5755 | 5282 | 4923 | 4652 | 4571 | 4487 | 4517 | 4457 | 4416 | 4440 |

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**Table II. Characteristics of new physics bachelors, 1979–80**

| Characteristics | Postbaccalaureate plans: Graduate study: physics | other | Employment | Undecided | Total |
|---|---|---|---|---|---|
| Sex | | | | | |
| Female* | 9% | 10% | 11% | 6% | 9.7% |
| Male | 91 | 90 | 89 | 94 | 90.3 |
| Citizenship | | | | | |
| U.S. | 94% | 92% | 98% | 94% | 95.6% |
| Foreign | 6 | 8 | 2 | 6 | 4.4 |
| Age | | | | | |
| 20 or younger | 2% | 1% | - | - | 0.7% |
| 21 | 8 | 9 | 3% | 1% | 6.0 |
| 22 | 51 | 53 | 42 | 47 | 47.5 |
| 23 | 19 | 21 | 24 | 26 | 21.7 |
| 24-29 | 17 | 15 | 25 | 21 | 20.2 |
| 30 and older | 3 | 1 | 6 | 5 | 3.9 |
| Minority group | | | | | |
| Black | 0.9% | 1.9% | 1.1% | 1.4% | 1.3% |
| Mexican American | 0.3 | 0.3 | 0.3 | 1.4 | 0.3 |
| Other Latin | 1.1 | .9 | 0.7 | 1.4 | 1.2 |
| American Indian | - | 0.3 | 0.3 | -- | 0.6 |
| Asian Indian | 0.3 | 0.9 | 0.4 | 1.4 | 0.8 |
| Oriental | 4.7 | 4.6 | 1.7 | 2.8 | 3.4 |
| Arab | 0.1 | 1.9 | 0.1 | - | 0.8 |
| Type of undergraduate institution | | | | | |
| PhD-granting | 62% | 47% | 45% | 47% | 50.7% |
| MS-granting | 11 | 10 | 12 | 1 | 10.8 |
| BS/BA-granting | 27 | 43 | 43 | 51 | 38.5 |
| Type of degree: | | | | | |
| Science | 73% | 60% | 73% | 60% | 69.3% |
| Arts | 27 | 40 | 27 | 40 | 30.7 |
| Double major | | | | | |
| with math | 20% | 18% | 12% | 13% | 16% |
| with engr. | 1 | 4 | 4 | - | 3 |
| with chem. | 2 | 5 | 1 | - | 2 |
| with other | 4 | 8 | 5 | 8 | 6 |
| Total number of bachelors | 1332 | 1066 | 1909 | 133 | 4440 |
| % distribution | 30% | 24% | 43% | 3% | 100% |
| Number of respondents | 757 | 612 | 1073 | 72 | 2514 |

** Percentage of women was adjusted for differential response rate.*

**Table III. Postbaccalaureate plans of the members of minority groups among the physics bachelors of the class of 1980.**

| Minority group: | Black | Mex. Am. | Am. Ind. | Other Latin | Asian Indian | Oriental U.S. | Oriental Foreign | Arab |
|---|---|---|---|---|---|---|---|---|
| Graduate study in physics | 7 | 2 | - | 8 | 3 | 17 | 19 | 8 |
| Other graduate study | 12 | 3 | 2 | 12 | 6 | 14 | 14 | 12 |
| Engineering | 11 | 1 | - | 2 | 1 | 5 | 6 | 12 |
| Medicine or biophysics | - | 1 | 1 | 2 | 3 | 5 | 2 | - |
| Computer sciences/math. | - | - | - | 3 | 1 | 2 | - | - |
| Other | 1 | 1 | 1 | 5 | 1 | 2 | 6 | - |
| Employment | 12 | 3 | 3 | 8 | 4 | 12 | 6 | 1 |
| Number of job offers: 0 | 1 | - | - | - | - | 2 | 2 | - |
| Number of job offers: 1 | 6 | 1 | - | 2 | 3 | 6 | 3 | - |
| Number of job offers: 2 | 1 | 1 | - | 1 | - | - | 1 | - |
| Number of job offers: > 3 | 4 | 1 | 3 | 5 | 1 | 2 | - | 1 |
| Undecided | 1 | 1 | - | 1 | 1 | - | 2 | - |
| Total | 32 | 9 | 5 | 29 | 14 | 43 | 41 | 21 |

**Table IV. Sources of anticipated support for first-year graduate study*, 1975 and 1980.**

| Sources of support | | Students planning: physics graduate study | | other graduate study | |
|---|---|---|---|---|---|
| | | 1975 | 1980 | 1975 | 1980 |
| Teaching assistantship | | 64% | 71% | 26% | 26% |
| Research assistantship | | 12 | 12 | 22 | 24 |
| Fellowship | | 12 | 10 | 13 | 12 |
| Employment | | 4 | 3 | 13 | 12 |
| Family, savings, loan | | 6 | 2 | 18 | 23 |
| Other | | 2 | 2 | 8 | 3 |
| Assured | | 89% | 88% | 78% | 75% |
| Intended | | 11 | 12 | 22 | 25 |
| Graduate study status | full-time | 99% | 98% | 98% | 96% |
| | part-time | 1 | 2 | 2 | 4 |
| Total | % | 100% | 100% | 100% | 100% |
| | N | 1645 | 1332 | 1234 | 1066 |

**The information was reported as of September of each academic year.*

The seven characteristics shown in **Table II** did not change significantly in recent years. Those changes that did occur include a gradually rising median age for physics bachelors, and a small decrease (3 percentage-points) in physics bachelors who graduated with a double major.

The first part of the questionnaire sent to each degree recipient deals with background characteristics, one of which is a listing of six distinct minority groups. In the 1980 survey 8% of the 2514 respondents identified themselves as members of a minority group including 21 Arabs, who specified their group under "other". Fourteen graduates identified themselves as Puerto Rican and are included under "other Latin".

A major difference exists between the postbaccalaureate plans of minorities and those of all physics bachelors; a higher proportion of the former group plans to enter graduate school, and in particular, "other graduate study", upon receiving the bachelor's degree. And singling out the foreign minority groups (Asian Indians, Orientals and Arabs) in **Table III**, we find that 82% report graduate study as their postbaccalaureate plans, while the bottom of **Table II** shows 54% for all physics bachelors.

Differences in sources of support for first-year graduate students are primarily related to subject of graduate study rather than the year of the degree. Nevertheless an examination of the data in **Table IV** shows a seven percentage-point increase in assistantships over a five-year period; on the other hand the large percentage of fist-year physics students assured of assistantships can be contrasted with the situation of those students interested in "other graduate study". Also, an increasing proportion of the latter group is dependent on support from family, savings, and loans. Close to 80% of each group of entering graduate students had only one source of support in 1980, and that percentage has not changed in recent years.

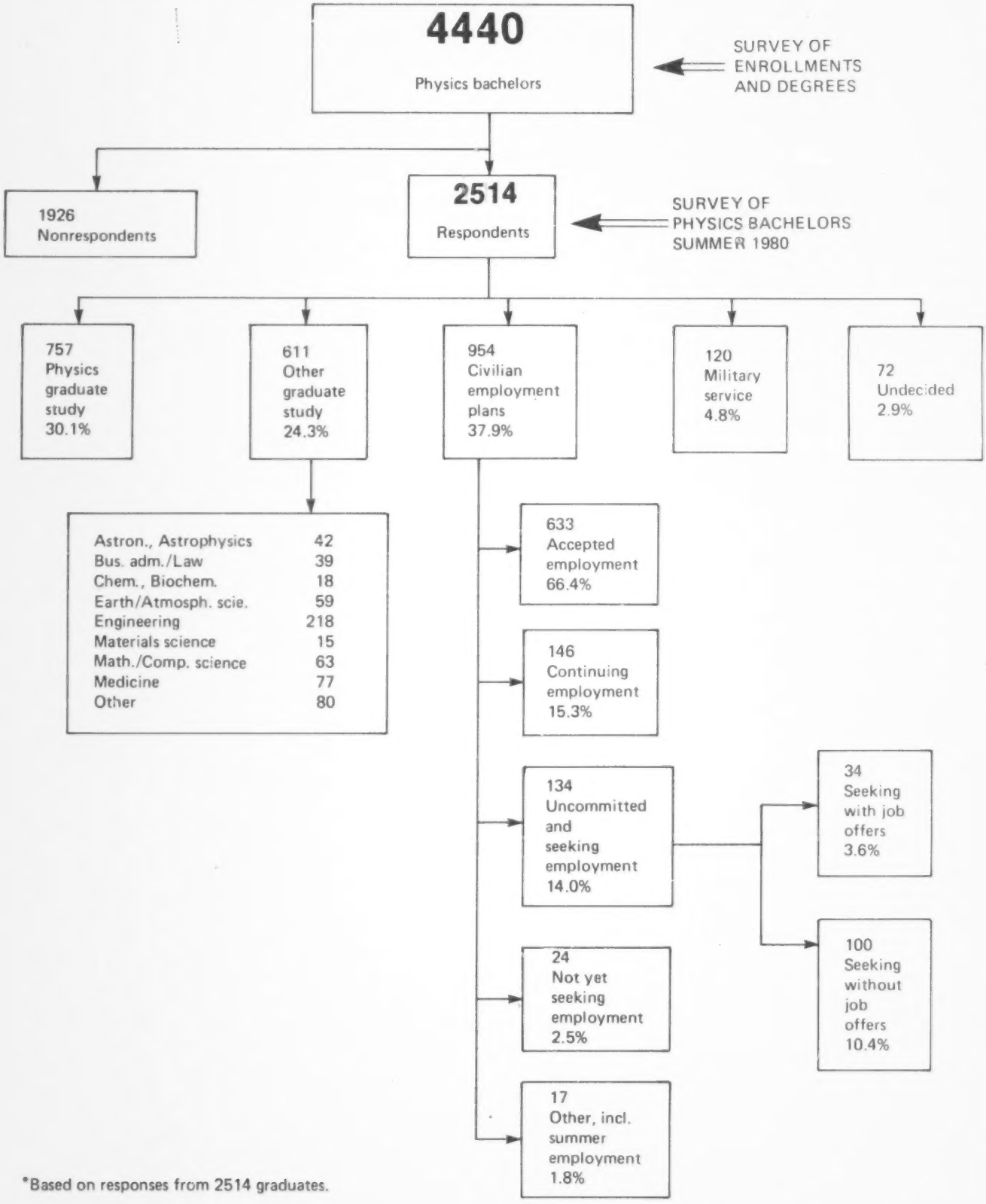
**Table V** shows a small change in trend of job opportunities: a decrease in multiple job offers offset by an increase in single job offers.

**Table V. Changes in employment outlook for new physics bachelors, 1973–80.**

| Number of job offers at graduation | Summer 1973 | Summer 1974 | Summer 1975* | Summer 1976* | Summer 1977 | Summer 1978 | Summer 1979 | Summer 1980 |
|---|---|---|---|---|---|---|---|---|
| 0 | 26% | 18% | 17% | 17% | 11% | 10% | 9% | 10% |
| 1** | 50 | 50 | 56 | 53 | 52 | 45 | 46 | 50 |
| 2 or more | 24 | 32 | 27 | 30 | 37 | 45 | 45 | 40 |

**These figures have been revised from those presented in earlier reports to include military commitments.*
***Bachelors who enter the military service are included here.*

Fig. II. Postbaccalaureate plans of physics bachelors of the class of 1980.*




*Based on responses from 2514 graduates.

Fig. III. Employment applications from new physics bachelors, 1980

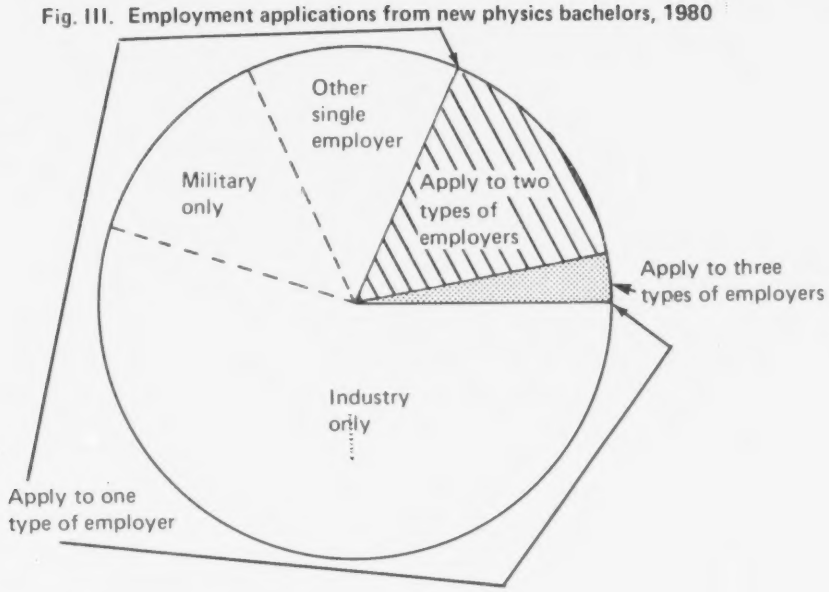

Other single employer
Military only
Apply to two types of employers
Apply to three types of employers
Industry only
Apply to one type of employer

**Figure II** illustrates the postbaccalaureate plans of the class of 1980. Although no major changes were recorded from the previous year's findings, there were minor changes. A higher proportion of physics bachelors headed for engineering schools; namely, 218 respondents or 36% of the group entering "other graduate study" did so in 1980 in contrast with 186 or 31% in the class of 1979. Another change noted was a one percentage-point increase in respondents who were "undecided" about their plans.

While the job market remains favorable for new physics graduates and therefore yields one thousand employment-oriented respondents annually, it seems appropriate to direct some additional questions at them. For example the question "are you not yet seeking employment?" was added to the questionnaire but checked off by only 1% of all survey respondents; it is included in **Figure II**. Another new question deals with the different types of employers a graduate will apply to; 82% of the employment-oriented bachelors applied only to one type of employer, and industry was chosen by 70% of that group. **Figure III** presents the distribution of answers to that new question. Being aware of the current demand for high school physics teachers, this survey recorded a total of only 38 graduates who applied to high schools for positions.

Industry continues to be the largest employer of physics bachelors as one can observe in **Table VI**. This trend table shows a six-year high in the proportion of graduates entering industry and a new six-year low in graduates attracted to high school employment.

**Table VI. Initial employment of physics bachelors, 1974–80.**

| Type of employer | Percentage of employed bachelors | | | | | |
|---|---|---|---|---|---|---|
| | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 |
| Industry manufacture | 25% | 30% | 32% | 37% | 40% | 41% |
| Industry service | 25 | 19 | 16 | 21 | 18 | 20 |
| High school | 11 | 11 | 8 | 7 | 6 | 3 |
| College or univ. | 5 | 4 | 5 | 3 | 4 | 3 |
| Government civilian employ. | 9 | 10 | 7 | 7 | 7 | 8 |
| Government career military | 16 | 13 | 12 | 14 | 15 | 16 |
| Research institutes | 4 | 3 | 7 | 7 | 6 | 7 |
| Other | 5 | 10 | 13 | 4 | 4 | 2 |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |

**Table VII. Use of physics training by type of employment, physics bachelors, 1980.**

| Newly accepted positions with selected types of employers | Use of physics training | | | Number reporting |
|---|---|---|---|---|
| | Extensive | Little | None | |
| Industry-manufacture | 53% | 43% | 4% | 292 |
| Industry-service | 40 | 54 | 6 | 143 |
| Govt., Peace Corps | 49 | 46 | 5 | 66 |
| Research institutes | 65 | 33 | 2 | 51 |
| All employers (newly accepted positions) | 51% | 45% | 4% | 596 |
| Continuing employment (all employers combined) | 34% | 51% | 15% | 137 |
| Selected work activities in newly accepted positions | | | | |
| Science teaching | 74% | 26% | - | 27 |
| Research & development | 78 | 22 | - | 196 |
| Engineering | 46 | 54 | - | 218 |
| Computer programming | 15 | 68 | 17% | 80 |
| Nonphysics professional work | 8 | 71 | 21 | 24 |

A measure of the quality of the job market is the extent to which a graduate's initial employment utilizes his or her physics training. **Table VII** highlights this topic and compares the "use of physics training" in newly accepted positions with that of employment graduates continue to hold. While **Table VII** indicates that choosing a new employer after completing the physics bachelor's degree is more likely to utilize one's training, those who continue with the same employer earn higher salaries.

With the amount of attention focused on inflation in recent years salary information continues to be in great demand, and salaries for new physics bachelors appear to have kept pace with inflation; **Table VIII** shows a median monthly salary of $1560.—for all employers combined, which represents a 17% increase over the previous year. Concerning the individual employers a striking salary difference exists between industry and high school comprising almost a 2:1 ratio.

More than ten years ago we started to publish separate salaries for men and women graduates with physics bachelor's degrees, and 1980 was the third successive year in which women reported a higher median salary than men. A major contributing factor to this salary differencc is the large proportion of men in the military at a relatively low salary. The comparable median starting salary for chemistry bachelors is $1250.—.

**Table VIII. Starting salaries of physics bachelors, 1980**

| Type of employer | Men (602 reported salaries) | | Women (88 reported salaries) | | Total (690 reported salaries) | |
|---|---|---|---|---|---|---|
| | Dist. by employer | Median monthly salary | Dist. by employer | Median monthly salary | Dist. by employer | Median monthly salary |
| Industry-manufacture | 41% | $1660 | 40% | $1675 | 41% | $1665 |
| Industry-service | 20 | 1630 | 24 | 1620 | 20 | 1630 |
| High school | 3 | 960 | 3 | * | 3 | 960 |
| Coll/Univ. | 3 | 1050 | 4 | * | 3 | 1150 |
| Government (civilian) | 7 | 1170 | 13 | 1490 | 8 | 1190 |
| Government (military) | 17 | 1040 | 6 | 935 | 16 | 1035 |
| Research institute | 7 | 1580 | 9 | 1540 | 7 | 1565 |
| Other | 2 | 1650 | 1 | * | 2 | 1650 |
| Total | 100% | $1555 | 100% | $1610 | 100% | $1560 |

**Insufficient data*

**Table IX. Full-time employment* of new physics bachelors, 1980**

| Work activity | Type of employer | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | Industry manufacture | Industry service | High school | Government civilian employment | Government military service | Research institute | Other | N | % |
| Teaching | 1 | 1 | 25 | 2 | - | - | 8 | 37 | 4 |
| Research & development | 118 | 31 | - | 27 | 13 | 46 | 18 | 253 | 29 |
| Engineering | 177 | 54 | - | 32 | 29 | 4 | 4 | 300 | 34 |
| Computer programming | 43 | 42 | - | 7 | 4 | 8 | 3 | 107 | 12 |
| Nonphysics professional | 6 | 11 | - | 8 | 36 | 3 | 3 | 67 | 8 |
| Skilled work | 9 | 6 | - | 2 | 4 | 3 | 2 | 26 | 3 |
| Management training | 4 | 5 | - | 2 | 14 | - | 1 | 26 | 3 |
| Other | 10 | 18 | - | 3 | 20 | 1 | 11 | 63 | 7 |
| Total N | 368 | 168 | 25 | 83 | 120 | 65 | 50 | 879 | |
| Total % | 42% | 19% | 3% | 9% | 14% | 7% | 6% | | 100% |

**The employment of these 879 graduates includes both newly accepted positions as well as those in which graduates are continuing.*

Unlike the statistics that concentrate on newly accepted positions, **Table IX** also includes bachelors who chose to continue the employment they acquired before completing their bachelor's degrees, as well as those who identify themselves as "employed, but seeking employment". Therefore, comparing the distribution of employers in **Table IX** with that in **Tables VI** and **VIII** one finds small differences between them.

# ASTRONOMY

**Table X. Postbaccalaureate plans of successive graduating classes of astronomy bachelors, 1974-1980.**

| Postbaccalaureate plans | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 |
|---|---|---|---|---|---|---|
| Astronomy graduate study | 42% | 46% | 28% | 33% | 28% | 35% |
| Other graduate study | 29 | 29 | 27 | 22 | 19 | 17 |
| Employment | 23 | 20 | 33 | 40 | 51 | 43 |
| Undecided | 6 | 5 | 12 | 5 | 2 | 5 |
| Total number of astronomy bachelors | 163 | 172 | 184 | 177 | 165 | 165 |

The new astronomy bachelors of the class of 1980 comprise less than 4% of the physics degree recipients for that year, making comparisons of postbaccalaureate plans seem less appropriate. A total of 165 astronomy bachelor's degrees were conferred in 1979-80 and there were 95 respondents. This series of astronomy surveys began six years ago.

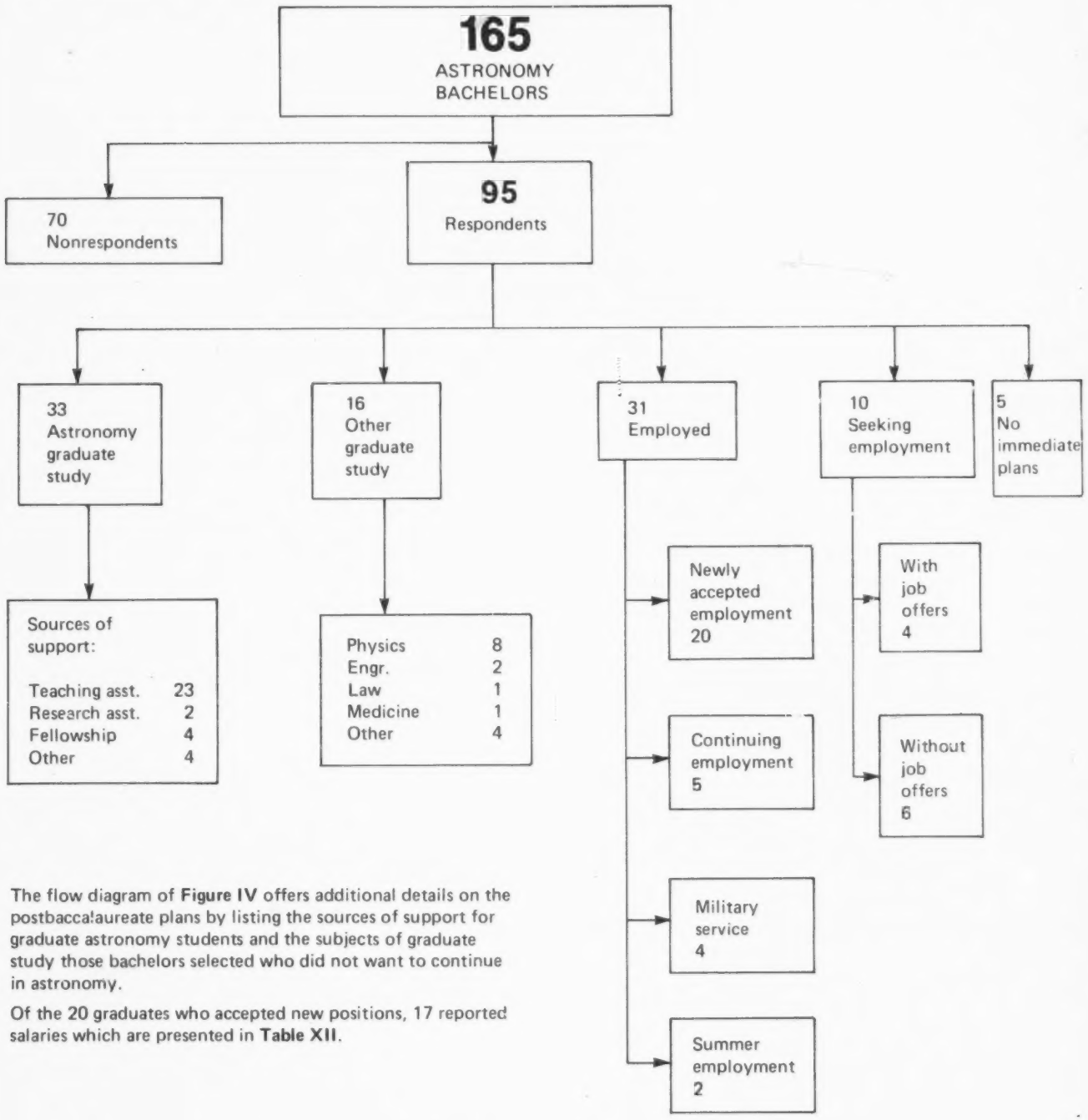
The influence the favorable job market has on astronomy bachelors in recent years is evident from **Table X**. However, one might expect a large proportion of the students who chose astronomy as their majors to enter graduate astronomy programs to become astronomers. The most recent year of data in **Table X** indicates some change in that direction, namely decreasing employment plans and increasing graduate study in astronomy.

Seven characteristics of astronomy bachelors are listed in **Table XI** none of which show significant changes from previous years.

**Table XI. Characteristics of astronomy bachelors, 1980.**

| Characteristics | | Postbaccalaureate plans: Astronomy graduate study | Other graduate study | Employment | Undecided | Total |
|---|---|---|---|---|---|---|
| Sex | Female | 4 | 4 | 11 | 2 | 21 |
| | Male | 29 | 12 | 30 | 3 | 74 |
| Citizenship | U.S. | 32 | 14 | 41 | 5 | 92 |
| | Foreign | 1 | 2 | - | - | 3 |
| Race | Puerto Rican | - | 1 | 1 | - | 2 |
| | Oriental | 1 | 3 | - | 1 | 5 |
| Age | 21 yrs or younger | 3 | 1 | 1 | - | 5 |
| | 22 yrs. | 17 | 10 | 21 | 2 | 50 |
| | 23 yrs. | 9 | 2 | 12 | 2 | 25 |
| | 24 yrs. or older | 4 | 3 | 7 | 1 | 15 |
| Type of bachelor's institution | Phd granting | 28 | 12 | 26 | 2 | 68 |
| | MS granting | 2 | 1 | 5 | 1 | 9 |
| | BS/BA granting | 3 | 3 | 10 | 2 | 18 |
| Type of degree | Science | 24 | 12 | 26 | 1 | 63 |
| | Arts | 9 | 4 | 15 | 4 | 32 |
| Double major | with physics | 8 | 9 | 6 | - | 23 |
| | with math | 3 | - | 3 | 1 | 7 |
| | with other | 1 | 2 | 2 | 1 | 6 |
| Total respondents | | 33 | 16 | 41 | 5 | 95 |

Fig. IV. Postbaccalaureate plans of astronomy bachelors of the class of 1980.




The flow diagram of **Figure IV** offers additional details on the postbaccalaureate plans by listing the sources of support for graduate astronomy students and the subjects of graduate study those bachelors selected who did not want to continue in astronomy.

Of the 20 graduates who accepted new positions, 17 reported salaries which are presented in **Table XII**.

**Table XII. Starting salaries for astronomy bachelors, 1980.**

| | Type of employer | | | | |
|---|---|---|---|---|---|
| | Industry | Government | Research institute | Other | All employers |
| Median monthly salary | $1580 | $1550 | $950 | $1150 | $1520 |
| Number reporting | 9 | 2 | 3 | 3 | 17 |